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Busting the Ghost Guns: A Technical, Statutory, and Practical Approach to the 3-D Printed Weapon Problem

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NOTES

Busting the Ghost Guns: A Technical, Statutory, and Practical Approach to the 3-D Printed Weapon Problem

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INTRODUCTION

The 2012 Aurora movie theatre shooting, the 2012 Clackamas, Oregon mall shooting, the 2012 Sandy Hook Elementary School shooting, the 2013 Chino, California school shooting, the 2013 Santa Monica, California shooting, and the 2013 Washington Navy Yard shooting—what do all of these events have in common? Each of these mass-shooting incidents involved the use of an AR-15-style assault rifle.[2] Over fifty people in the last year were senselessly killed in these mass-shootings involving this particular weapon.[3] Political leaders from all over the country called for stricter gun control in the wake of these tragedies, but they were left with a stymied and unresponsive Congress.[4] No real reply has addressed the growing concerns and heated gun control debate. But, the solution may not be as easy as some think: a huge technological revolution has the potential to repudiate and render obsolete gun laws as they stand today.

As if the use of the same weapon in these mass-shootings is not shocking enough, technology has now evolved to the point where computer users can make parts of these rifles in their own home with the use of three-dimensional (hereinafter 3-D) printing. A printer costing as little as $1,000 can now print the lower receiver of the AR-15 rifle, which is the part of the gun that houses all of its

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[2] *See* Ben Brumfield, *Navy Yard Shooting: AR-15, Back in the News – Briefly*, CNN, http://www.cnn.com/2013/09/17/us/ar-15-gun-debate (last updated Sept. 17, 2013, 8:59 AM); Samantha Tata, Nyree Arabian & Tony Shin, *Child Fires Officer's Rifle at Elementary School*, NBCLA.COM (Oct. 24, 2013, 4:47 AM), http://www.nbclosangeles.com/news/local/Chino-Newman-Elementary-School-Safety-Demonstration-Weapon-Gun-Misfires-Injures-228984301.html.

[3] *See* Katy Hall, Ethan Fedida & Jan Diehm, *There Have Been More Mass Shootings Since Newtown Than You've Heard About (INFOGRAPHIC)*, HUFF POST: CRIME (Nov. 11, 2013, 4:19 PM), http://www.huffingtonpost.com/2013/09/17/mass-shootings-2013_n_3941889.html; Aviva Shen, *A Timeline of Mass Shootings in the US Since Columbine*, THINK PROGRESS (Dec. 19, 2012, 8:19 AM), http://thinkprogress.org/justice/2012/12/14/1337221/a%ADtimeline%ADof%Admass%ADshootings%ADin%ADthe%ADus%ADsince%ADcolumbine/1/12.

[4] *See* Jonathan Weisman, *Senate Blocks Drive for Gun Control*, N.Y. TIMES, Apr. 17, 2013, http://www.nytimes.com/2013/04/18/us/politics/senate-obama-gun-control.html?pagewanted=all&_r=1&.

working parts and is what is considered to be a "firearm" by law.[5] This lower receiver contains the serial number of the weapon,[6] and one made by a printer can be combined with the barrel and all other parts easily purchasable online.[7] A novice computer user could have himself his very own AR-15 that is completely untraceable and functional in a matter of minutes. All he would have to do is buy a 3-D printer, which are becoming more and more accessible to the masses with evolving technology and cheaper manufacturing, download a CAD file, and print the gun. The thought that guns can be made and stockpiled within a home is a sobering realization, but one that lawmakers need to face head-on. If legislatures and regulatory agencies do not act fast, they can lose valuable ground in the regulation of the manufacture, possession, and distribution of these homemade guns.

This Note will discuss the implications 3-D printers will have on the Constitution, current gun laws, and how 3-D printing can possibly fit into the framework of case law as it currently stands. There are serious First and Second Amendment implications with the use of a 3-D printer and they grow increasingly more difficult to address with emerging technology and file sharing across the Internet. A solution to this 3-D printing problem cannot and will not be able to take one single shape; it must be multi-dimensional and multi-disciplinary, and most importantly, it must come quickly. This technology hit the market only a little over a year ago and users have already created fully functioning guns, one million gun plans have been downloaded, and printer prices have dropped from $10,000 to $1,000. Technology moves fast, especially this type of innovative and consumer-desired technology, and lawmakers need to keep up.

Part I of this Note will discuss the basics of 3-D printing: what it is, how it works, what it can make, how the products have evolved over time, and 3-D printing implications in relation to the Second Amendment. This section provides a general background to explain the guns, how they work, and their implications on constitutional law. Part II will discuss current gun laws in the United States and how 3-D printing threatens the current statutory framework. Finally, Part III discusses how current proposed legislation fails to solve the gun control problem and posits a multi-disciplinary approach on how to solve this 3-D printing problem, so that the printing does not become so rampant that regulation is no longer a viable option. This approach includes technological, statutory, and practical aspects in order to confront this technology on many different levels, to serve the purposes of gun control, and to quell fears about these new plastic guns. It is still very early in this technology's life, but it seems to be just the time for prevention and management, starting on the ground floor. The nickname "ghost guns" is particularly fitting, as these 3-D printed guns are elusive and can fly under

[5] 18 U.S.C. § 921(a)(3)(B) (2012) (defining firearm as the receiver of a weapon).

[6] 27 C.F.R. § 478.92(a)(1)(i) (2014) (stating that manufacturer of firearms must identify their firearms by engraving or otherwise noting a serial number on the frame or receiver of said weapon).

[7] Kaja Whitehouse, *3D Printer and $452 Makes On-demand AR-15*, N.Y. POST (Dec. 6, 2013, 7:16 AM), http://nypost.com/2013/12/06/3d-printer-and-452-makes-on-demand-ar-15.

the radar, and speedy reform is the only way to bust them before they can cause serious damage.

I. ORIGINS AND IMPLICATIONS

A. 3-D Printing Basics

A 3-D printer is a printer unlike one that the world has ever seen before, as it can create an object in a matter of minutes from home. A traditional printer can print a flat, two-dimensional ("2-D") ink picture of Yoda, but a 3-D printer can "print" a plastic sculpture of Yoda. This technology has become increasingly useful in many different fields, and can be used for printing medical, dental, aerospace, automotive, toy, furniture, art, and fashion products.[8]

The 3-D printing process utilizes the method of additive manufacturing, which means adding hundreds or thousands of horizontal layers of materials on top of one another to create a final product.[9] This basic idea can be compared to stalagmites and stalactites in caves, in which dripping water over thousands of years layered mineral deposits on top of one another that eventually accumulated to form these protrusions.[10] Unlike in caves, a 3-D printer can quickly and easily layer pliable materials, such as plastic, metal, and ceramic to create the user's plan.[11]

There are several different types and methods of 3-D printing that have evolved over the past twenty years. Four primary types of printing have emerged: inkjet-style printing, binder-printing, photopolymerization printing, and printing by sintering. First, direct 3-D printing uses inkjet technology to layer plastic polymer materials on top of one another, just as an inkjet lays ink, but the nozzle moves up and down to create a 3-D rather than 2-D image.[12] Second, binder-printing uses the same inkjet nozzles, but dispenses a thin dry layer of powder and then the nozzle makes a second pass on the layer to apply the binder or "liquid glue."[13] The process of layering a powder and then glue repeats until complete and the design has been fully printed.[14] Third, photopolymerization requires layering drops of a liquid that turn solid when exposed to an ultraviolet laser beam.[15] The exposure and layering process repeats just like the laser jet printing until the object is created.[16] Fourth, sintering requires a "laser to melt a flame-retardant plastic powder, which then solidifies to form the printed layer."[17]

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[8] Stephanie Crawford, *How 3-D Printing Works*, HOW STUFF WORKS, http://computer.howstuffworks.com/3-d-printing.htm (last visited Jan. 15, 2015).

[9] *See id.*; Jon Hembrey, *How Exactly Does 3-D Printing Work?*, CBC NEWS (Jan. 28, 2013, 11:22 AM), http://www.cbc.ca/news/technology/how-exactly-does-3d-printing-work-1.1371800.

[10] Crawford, *supra* note 8.

[11] Hembrey, *supra* note 9.

[12] Crawford, *supra* note 8.

[13] *Id.*

[14] *Id.*

[15] *Id.*

[16] *Id.*

[17] *Id.*

This is particularly useful for printing metal objects because the metal requires melting and then reshaping to form the final product.[18]

In order to create a 3-D printed object, a computer user must first create or download a computer-generated plan using a computer-assisted design (CAD) software program.[19] The CAD program allows the user to create a 3-D model of the desired object and can hint at its structural integrity as well.[20] This is where the user can really make the object his own, sculpting and modifying it to fit his desired characteristics. The user will then convert the CAD file to the STL format, which is a file format specifically designed for 3-D printing.[21] He can then further modify the file to prepare it for printing by specifying the "size and orientation" of the object.[22] The user then simply fills the cartridges with the correct material for printing and lets the printer do the work.[23] Other than removing the object, wiping off the excess residue, and using the finished product, the printing process is then complete.[24] Novice printer users can download these CAD designs directly from the internet, as free CAD designs are now readily available on a multitude of websites.[25] This allows even the most amateur printer access to hundreds of thousands of printable files, including files that contain designs for weapons.[26]

Additionally, certain new emerging technologies do not require this complicated CAD creation in order to print in 3-D. Microsoft Kinect, typically used in connection with the Microsoft Xbox gaming system, is really a tool that can map images in three dimensions.[27] It is basically a 3-D scanner in the sense that one could simply rotate the sensor around an object, allowing the device to capture all dimensions, and that data can then be used to print the object on a 3-D printer.[28] The Structure Sensor is the mobile version of the Kinect device, which is essentially a 3-D scanner that clips to an iPad or any other tablet, allowing the portable device to scan in three dimensions.[29] It can then send the data to a 3-D

[18] *Id.*

[19] Hembrey, *supra* note 9.

[20] Crawford, *supra* note 8.

[21] *Id.*

[22] *Id.*

[23] *Id.*

[24] *Id.*

[25] 3D CONTENT CENTRAL, http://www.3dcontentcentral.com (last visited Jan. 20, 2014); 3DTIN, http://www.3dtin.com (last visited Jan. 20, 2014); GRABCAD, http://grabcad.com/library (last visited Jan. 20, 2014); *Thingverse*, MAKERBOT, http://www.thingiverse.com (last visited Jan. 20, 2014); TRACEPARTS, http://www.tracepartsonline.net/(S(4tj45aellcdny5m5ijrnkr5y))/content.aspx (last visited Jan. 20, 2014); *Where to Find Free 3D CAD Models for 3D Printing*, 3D PRINTING SYSTEMS, http://3dprintingsystems.com/where-to-find-free-3d-cad-models-for-3d-printing/ (last visited Jan. 20, 2014).

[26] See Natasha Lennard, *The Pirate Bay Steps in to Distribute 3-D Gun Designs*, SALON (May 10, 2013, 1:11 PM), http://www.salon.com/2013/05/10/the_pirate_bay_steps_in_to_distribute_3d_gun_designs/.

[27] Dan Nosowitz, *A 3-D-Scanning Depth Sensor You Can Clip to an iPad*, POPULAR SCI. (Sept. 17, 2013, 3:30 PM), http://www.popsci.com/gadgets/article/2013-09/kinect-depth-sensor-you-can-strap-ipad?dom=PSC&loc=recent&lnk=4&con=a-3dscanning-depth-sensor-you-can-clip-to-an-ipad.

[28] *Id.*

[29] *Id.*

printer, creating a replica of the real-world object.[30] Then, the mobile application converts the raw 3-D data from a scanner into usable and printable files.[31] This application, called Volumental, can help a user create the 3-D printed object by automatically creating a design to print, so any manual engineering of the product design is done by the application.[32] So, any layperson could scan an object and the application would clean up the 3-D design automatically. The user would then have a usable file to print, and the printing could begin without any designing or engineering at all.[33] Overall, this application makes 3-D printing much more accessible by removing the need for any engineering knowledge from the equation.[34]

Further, 3-D printers are becoming even more affordable and available in the market. Originally, 3-D printers were only available for commercial use and only major technological and manufacturing companies utilized them, as the technology was incredibly expensive.[35] But, in the last few years, 3-D printers have dropped significantly in price, making them better suited for personal use.[36] Today, consumers can purchase 3-D printers online for anywhere between $1,299 for the Cube single head 3-D printer to $2,499 for a MakerBot Replicator 2X.[37] While still costly, these printers are dropping in price and increasing in popularity. In 2012, one leading company, Stratasys, saw revenues of $215 million and its stock was up over sixty-percent.[38] It is clear that the popularity of 3-D printers is on the rise based on the market alone. Even school systems have started using 3-D printers as teaching tools, from Connecticut, to North Carolina, to Illinois, to California, showing that this technology has found a place outside of manufacturing and is here to stay.[39]

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[30] *See id.*

[31] *See* Dan Nosowitz, *3-D Scan and Print Right from Your Browser*, POPULAR SCI. (Aug. 22, 2013, 2:28 PM), http://www.popsci.com/gadgets/article/2013-08/finally-easy-way-3-d-scan-and-print?dom=PSC&loc=recent&lnk=5&con=3d-scan-and-print-right-from-your-browser.

[32] *See id.*

[33] *See id.*

[34] *See id.*

[35] *See* Crawford, *supra* note 8.

[36] *See id.*

[37] *3D Printers Order Form*, TURBOCAD, http://www.turbocad.com/Portals/1/Charts/Printer-Order-Form.pdf (last visited Jan. 5, 2015).

[38] Karsten Strauss, *The Year Ahead in 3D Printing: Stratasys*, FORBES (Dec. 20, 2013, 2:24 PM), http://www.forbes.com/sites/karstenstrauss/2013/12/20/the-year-ahead-in-3d-printing-stratasys.

[39] Alexandra Chachkevitch, *3-D Printer Wins over Students, Teachers at Glen Grove Elementary School*, CHI. TRIB. (Dec. 22, 2013), http://articles.chicagotribune.com/2013-12-22/news/ct-glen-grove-3d-printers-tl-n-20131221_1_3-d-printer-students-and-teachers-curriculum; Tom DiChristopher, *Will 3-D Printers Pass the Holiday Shopping Test?*, CNBC (Dec. 24, 2013, 1:38 PM), http://www.cnbc.com/id/101295424; Venita Jenkins, *School Program Using 3D Printer Sparks Girls' Interest in Technology*, FAYOBSERVER.COM (Jan. 16, 2014, 7:15 AM), http://www.fayobserver.com/news/local/article_3cba86b6-d107-5327-96c9-5d6d13f47beb.html; Suzi Parker, *Innovation Update: 3-D Digital Technology Finds Its Place in the Classroom, and It's Eye-Popping*, TAKE PART (Jan. 6, 2014), http://www.takepart.com/article/2014/01/06/innovations-high-middle-school-Autodesk.

B. The Dangerous Side to 3-D Printing: Guns

With this new, evolving and frankly mind-blowing technology, there comes the concern that its uses will turn nefarious. Since 3-D printing began, many helpful and beneficial products have been made, but so have unregistered and undetectable guns. Cody Wilson, a law student from Austin, Texas, began the trend by creating the world's first-ever 3-D printed gun made from plastic, which he named the "Liberator."[40] The "Liberator" was able to fire a few shots without cracking, and the shots from this plastic gun could be lethal.[41] Wilson began an organization, Defense Distributed, which he used to distribute the computer engineered CAD-created blueprint for the "Liberator."[42] Defense Distributed posted the design for the homemade gun on its website, and the plan was downloaded over 100,000 times in just two days.[43] The Department of State issued a cease and desist order to Wilson.[44] Notably, it was not the Department of Homeland Security or the Bureau of Alcohol, Firearms, Tobacco, and Explosives (hereinafter the ATF) that issued the order, [45] although one would expect these agencies to have a great interest in 3-D printed guns as well. Wilson took the plan down and scrubbed Defense Distributed's website, but the plan had already been downloaded over one million times and it is still shared today on peer-to-peer file-sharing networks like Pirate Bay, where it is one of the site's most popular 3-D printable downloadable files.[46] Even though Wilson has taken down the gun designs from his website, they in no way have been erased from the Internet.[47]

Other 3-D printing enthusiasts have begun to enter the world of 3-D gun printing as well, some even creating plastic rifles that can successfully fire up to ten shots without cracking.[48] It is now even possible to print metal guns at home.[49] Solid Concepts, an Austin, Texas based company, has already created and tested the world's first 3-D printed metal gun.[50] The new metal pistol can fire fifty

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[40] Todd Sperry, *U.S. Requires Group to Remove 3-D Gun Instructions from Its Website*, CNN POLITICS (May 13, 2013, 10:51 AM), http://www.cnn.com/2013/05/09/politics/3-d-guns/index.html.

[41] Georgi Kantchev, *Authorities Worry 3-D Printers May Undermine Europe's Gun Laws*, N.Y. TIMES, Oct. 17, 2013, http://www.nytimes.com/2013/10/18/business/international/european-authorities-wary-of-3-d-guns-made-on-printers.html?pagewanted=2&_r=1&.

[42] *See* Sperry, *supra* note 40.

[43] *Id.*; Andy Greenberg, *3D-Printed Gun's Blueprints Downloaded 100,000 Times in Two Days (With Some Help from Kim Dotcom)*, FORBES (May 8, 2013, 5:12 PM), http://www.forbes.com/sites/andygreenberg/2013/05/08/3d-printed-guns-blueprints-downloaded-100000-times-in-two-days-with-some-help-from-kim-dotcom.

[44] Sperry, *supra* note 40.

[45] *Id.*

[46] *Id.*; Greenberg, *supra* note 43.

[47] *See* Greenberg, *supra* note 43; Sperry, *supra* note 40.

[48] Kantchev, *supra* note 41.

[49] Andy Greenberg, *The $1,200 Machine That Lets Anyone Make a Metal Gun at Home*, WIRED (Oct. 1, 2014, 6:30 AM), http://www.wired.com/2014/10/cody-wilson-ghost-gunner/.

[50] Scott McGowan, *World's First 3D Printed Metal Gun Manufactured by Solid Concepts*, SOLID CONCEPTS, http://www.solidconcepts.com/news-releases/worlds-first-3d-printed-metal-gun-manufactured-solid-concepts (last visited Jan. 15, 2015).

successive rounds, and is made entirely from 3-D printed materials.[51] Solid Concepts used metal sintering technology to create the metal gun parts and guns, illustrating the fact that the 3-D printing sintering technology is powerful and incredibly accurate.[52] Needless to say, the creation of both plastic and metal guns implicates several current firearm laws and constitutional rights, which may not be adequately equipped to handle these new challenges.

C. Second Amendment Significance

The Second Amendment comes into play in the 3-D printed gun debate because it provides the constitutional basis for Americans to "keep and bear Arms," and it expressly states that this right "shall not be infringed."[53] The issue of making and keeping personal weapons under the Second Amendment has embroiled the American people in a lengthy and intense debate over gun control.[54] Part of the tension lies between safety in owning a gun for personal protection and guns falling into the wrong hands of those who only wish to seek harm. The issue of 3-D printing only further complicates the debate. Many of the gun control measures that have been enacted are now profoundly obsolete, as the average consumer, with no specialized 3-D printing knowledge and a modest amount of money, can now make and create a gun in his or her home, completely unregulated.

But as it stands, current case law has consistently overruled gun control measures that could infringe on the Second Amendment. Beginning with the landmark case, *District of Columbia v. Heller*, the United States Supreme Court reaffirmed Second Amendment rights, allowing private ownership of guns.[55] The Court confronted the balance between self-protection and the policy benefits of outlawing personal use of handguns in the home in the District of Columbia.[56] In reading and interpreting the text of the Amendment itself, the Court rejected the petitioner's reading of the Amendment that keeping and bearing arms should only be allowed in connection to service in the militia, and instead it adopted the view that the Amendment should allow the possession of a gun for protection in a private home.[57] In order to adopt this view, the Court divided the Amendment into the "prefatory clause" and the "operative clause," noting that the prefatory clause regarding the militia merely introduces a purpose for the Amendment, but the operative clause is not limited by that purpose; rather, the right to keep and bear arms is an individual right that "belongs to all Americans."[58] With this right,

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[51] *Id.*

[52] *Id.*

[53] U.S. CONST. amend. II.

[54] *See* Melissa Jeltsen, *3D Printed Gun Movement Poses Challenge to Gun-Control Efforts (VIDEO)*, HUFFINGTON POST (Mar. 27, 2013, 10:37 AM), http://www.huffingtonpost.com/2013/03/26/3d-printed-gun-movement_n_2957695.html.

[55] 554 U.S. 570, 635 (2008).

[56] *See id.* at 574, 628–29.

[57] *Id.* at 628–29.

[58] *Id.* at 577–81.

Americans are able to "keep" a gun, in the sense that they can own and possess guns, and they may "bear" arms in the event of a confrontation.[59] This case protects gun owners and their rights, allowing them to use a gun for personal protection and immediate self-defense, overruling the statute that prohibited handguns in the city.[60] The result here laid the framework and background for other gun control legislation and challenges to the Second Amendment.

Two years later, the Court took up the issue again when Chicago enacted municipal legislation that banned the ownership and usage of guns in the city.[61] The law met similar opposition and ultimately failed.[62] In *McDonald v. City of Chicago*, Respondents argued that the city's handgun regulation did not violate due process because the Second Amendment does not apply to the States.[63] However, Petitioners argued that the Second Amendment did apply to the states through the Due Process Clause of the Fourteenth Amendment.[64] The Court agreed, finding that the Fourteenth Amendment requires that the Second Amendment applies to all states, and therefore ruled Chicago's municipal ban on handguns unconstitutional.[65] The Court relied again on *Heller* when it found that the right to self-defense is a "central component [to] the Second Amendment right," as "the need for defense of self, family, and property is most acute in the home."[66]

Heller and *McDonald* together seem to suggest that the prohibition of guns is out of the question in federal, state, and local law. The Second Amendment right to own a weapon for personal protection has survived the Supreme Court's scrutiny so far. But, these cases were decided before the invention of the 3-D printer, before guns were made available to all, and before guns had the potential to be so pervasively untraceable. The same arguments and defenses may no longer hold. With both *Heller* and *McDonald* setting the precedent for gun control laws, regulation of these 3-D printed guns will be tricky, as they are now fundamentally protected under the Second Amendment. These homemade 3-D printed guns seem to truly fit the type of weapon that the Court had in mind because they are made in the home with the assumed use to be for self-protection, lending more credence to the argument against regulation and further complicating the debate.

While *Heller* and *McDonald* do protect gun rights and gun possession, the cases make no mention of and do not focus on the right to make or create guns for personal use.[67] Other gun-related laws provide insight into the acquisition of these weapons.

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[59] *Id.* at 582–84, 592.

[60] *Id.* at 635–36.

[61] McDonald v. City of Chicago, 561 U.S. 742, 748–50 (2010).

[62] *See id.* at 791.

[63] *Id.* at 749–50 .

[64] *Id.* at 753.

[65] *Id.* at 791.

[66] *Id.* at 767–68 (internal quotation marks omitted) (citing District of Columbia v. Heller, 554 U.S. 570, 599, 628 (2008)).

[67] *See generally McDonald*, 561 U.S. at 742; *Heller*, 554 U.S. at 570.

II. FEDERAL GUN REGULATIONS

Along with the ATF, there are three critical pieces of federal legislation that currently regulate guns: the Gun Control Act,[68] the National Firearms Act,[69] and the Undetectable Firearms Act.[70] Unfortunately, it seems as though these laws are soon to be rendered outdated and under-inclusive as 3-D printing of guns becomes more accessible and prolific. The Gun Control Act of 1968 was designed to regulate the exchange of firearms across state lines through Congress's power to regulate interstate commerce.[71] This Act regulates all "Title I firearms," which is defined as:

> (A) any weapon (including a starter gun) which will or is designed to or may readily be converted to expel a projectile by the action of an explosive;
>
> (B) the frame or receiver of any such weapon;
>
> (C) any firearm muffler or firearm silencer; or
>
> (D) any destructive device.
>
> Such term does not include an antique firearm.[72]

This means that all firearms that fall under this definition are regulated by the measures in place in the Gun Control Act.[73] So any manufacturers, importers, or dealers of these types of firearms must receive a permit from the Attorney General and must acquire a federal firearms license.[74] Anyone else who manufactures or acquires these weapons need not apply for a permit.[75] But of course, anyone purchasing a gun must still go through the procedures required by the Brady Handgun Violence Prevention Act.[76] This Act obligates a seller to perform an extensive background check on the buyer, who would then issue a denial if it is determined during the three-day waiting period that the buyer is a fugitive, a felon, or a drug addict.[77] Neither the Gun Control Act nor the Brady Act mention or

[68] Gun Control Act of 1968, Pub. L. No. 90-618, 82 Stat. 1213 (codified in scattered sections of 18 U.S.C.).

[69] National Firearms Act of 1934, Pub. L. No. 74-474, 48 Stat. 1236 (codified as amended at 26 U.S.C. ch. 53 (2012)).

[70] Undetectable Firearms Act of 1988, Pub. L. No. 100-649, 102 Stat. 3816 (codified in scattered sections of 18 U.S.C.).

[71] 18 U.S.C. § 922 (2012).

[72] *Id.* § 921; *see also* Rich Brown, *You Don't Bring a 3D Printer to a Gun Fight—Yet*, CNET (Sept. 6, 2012, 4:00 AM), http://news.cnet.com/8301-17938_105-57499326-1/you-dont-bring-a-3d-printer-to-a-gun-fight-yet (describing various types of Title I weapons).

[73] 18 U.S.C. § 921(a)(3).

[74] *Id.* § 923(a), (d)(1)(F).

[75] *Id.* § 923(a) (requiring persons engaged "in the business of importing, manufacturing, or dealing in firearms" to apply for licensure).

[76] Brady Handgun Violence Prevention Act, Pub. L. No. 103-159, § 102, 107 Stat. 1536 (1993) (codified as amended at 18 U.S.C. § 922 (2012)).

[77] *Id.* § 102(a)(3)(B).

stipulate any unique procedures for home-manufacture of weapons, so it seems as though making guns for personal use at home would be acceptable under these two statutes, provided that the weapons fit the Title I descriptions in the Gun Control Act.

On the other hand, the National Firearms Act regulates Title II weapons regardless of whether they are manufactured at home or elsewhere and regardless of whether they are for personal use or commercial sale.[78] All of these weapons must be registered with the National Firearms Registration and Transfer Record and must include: "(1) identification of the firearm; (2) date of registration; and (3) identification and address of person entitled to possession of the firearm."[79]

These Title II weapons are the more highly regulated weapons, as they are the more dangerous weapons.[80] This can be seen in the general definition of "firearm" under this Title, as a firearm is defined as:

> (1) a shotgun having a barrel or barrels of less than 18 inches in length;
>
> (2) a weapon made from a shotgun if such weapon as modified has an overall length of less than 26 inches or a barrel or barrels of less than 18 inches in length;
>
> (3) a rifle having a barrel or barrels of less than 16 inches in length;
>
> (4) a weapon made from a rifle if such weapon as modified has an overall length of less than 26 inches or a barrel or barrels of less than 16 inches in length;
>
> (5) any other weapon, as defined in subsection (e);
>
> (6) a machinegun;
>
> (7) any silencer (as defined in section 921 of Title 18, United States Code); and
>
> (8) a destructive device.[81]

Again, there is no mention of home-manufacture or self-creation when it comes to these weapons.[82] The entire Act is void of any stipulation for or reference to self-made weapons, but presumably any weapons that fall into the above-mentioned categories would need to be registered regardless of whether they were self-made or purchased. However, the Act does mention that any "maker" of firearms must register the firearms that fall under the Act, which presumably includes makers at home.[83] Additionally, the National Firearms Act does require a registrant to fill out the ATF Form 5320.1, entitled "Application to Make and

[78] 26 U.S.C. § 5841 (2012); *see also* Brown, *supra* note 72 (explaining that federal law mandates filling out an "Application to Make and Register a Firearm" prior to making or possessing a firearm).

[79] 26 U.S.C. § 5841.

[80] Brown, *supra* note 72.

[81] 26 U.S.C. § 5845.

[82] *Id.*

[83] *Id.* § 5841.

Register a Firearm."[84] The 3-D printed guns likely fall into the Title II category of guns, so all makers of these weapons, regardless of whether the guns are made for sale or for personal use, would need to fill out the ATF form and receive law enforcement's approval before manufacturing 3-D printed weapons.[85]

Lastly, the Undetectable Firearms Act seems to govern these 3-D printed weapons as well.[86] Upon its expiration at the end of 2013, the House voted to renew the Act for another ten years.[87] This Act, in particular, will certainly impact the regulations on 3-D printed guns in the future. The Act makes it unlawful to possess any weapon that would not be detectable by a metal detector used for security purposes.[88] It requires that all firearms contain at least 3.7 ounces of metal as the base threshold in order to set off the metal detector.[89] The penalty for knowingly possessing these unlawful weapons can come in the form a fine, imprisonment of up to five years, or both.[90] Originally enacted to combat the plastic components created for the Glock 17 handgun, which never could successfully pass through a metal detector, the law remains in place.[91] The Undetectable Firearms Act could govern these 3-D printed guns because the guns printed at home are made primarily from plastic. Defense Distributed's Cody Wilson created the "Liberator," the company's 3-D printable gun, with a non-functional six-ounce piece of metal in the gun in order to overly-comply with this Act.[92] But clearly that non-functional cube is not necessary for the use and successful firing of this plastic gun, so others not as compliant as Wilson could easily choose to exclude that piece, thus violating the Act. And just as these weapons are largely undetectable for security purposes, they are equally as difficult to track, monitor, and regulate because they can be printed at home quickly and easily.

Overall, at-home 3-D printed guns pose several problems. First, users that print them may not violate the Gun Control Act because the primary use of the guns will be for protection at home and could fall under Title I. Under *Heller* and *McDonald*, the Second Amendment would largely protect this use. If the 3-D printed guns, however, fall into Title II and under the National Firearms Act, then any maker would need to register his or her gun. And, as with any mandatory post

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[84] Bureau of Alcohol, Tobacco, Firearms and Explosives, *Application to Make and Register a Firearm*, http://www.atf.gov/files/forms/download/atf-f-5320-1.pdf (last visited Jan. 15, 2015) ("The undersigned hereby makes application, as required by Sections 5821 and 5822 of the National Firearms Act, Title 26 U.S.C., Chapter 53, to make and register the firearm described below.").

[85] Brown, *supra* note 72.

[86] Undetectable Firearms Act of 1988, Pub. L. No. 100-649, 102 Stat. 3816 (codified as amended at 18 U.S.C. § 922 (2012)).

[87] Alicia A. Caldwell, *U.S. House Votes to Renew Undetectable Firearms Act*, THE DENVER POST (Dec. 4, 2013, 12:01 AM), http://www.denverpost.com/nationworld/ci_24649464/u-s-house-votes-renew-undetectable-firearms-act#ixzz2qwvDUTVd.

[88] Undetectable Firearms Act of 1988 § 2.

[89] *Id.*

[90] *Id.*

[91] Brown, *supra* note 72.

[92] *See* Greenberg, *supra* note 43; Sperry, *supra* note 40.

hoc registration that is not required to receive the item, there is a risk that the guns will go unregistered and unregulated. The public at large has not been educated about gun-making and weapon registration; whereas, gunsmiths and commercial manufacturers know about the ATF regulations and forms because they are in the industry and knowledgeable about its regulations. At-home, casual printers would not necessarily be well informed and know that they need to fill out forms, acquire approval, and register their weapons. Also, these casual users would most likely not be aware of the 3.7-ounce metal requirement and could make all-plastic guns that do not comply with the Undetectable Firearms Act. These plastic guns could easily slip through a number of security checks at airports, events, and even schools. Making the guns at home does not afford the protection and benefits of the Brady Act like background checks, denial to felons, and the waiting period. The true problem lies in the untraceable nature of 3-D printed guns and the inability to control who has access to these guns, such as children, because even the most pedestrian printer has the ability to print a gun. The most comprehensive solution will require a multi-step, multi-disciplinary approach that crosscuts many industries while informing printers. As of right now, the current statutory framework is ill equipped to handle this new and emerging problem.

III. A PRACTICAL, NOT PERFECT, SOLUTION

A. Current Proposed Legislation Not Positioned for Success

Several local governments have begun proposing legislation that targets 3-D printed guns, but most are under-inclusive and depend heavily on user-registration of the guns post manufacture. Philadelphia was the first city to take the plunge and forthrightly ban all 3-D printed guns.[93] But it seems as though this local ordinance was passed in a hasty manner, intended to curb the manufacture of weapons like Wilson's "Liberator," as the plans are easily accessible online.[94] The city now requires that anyone engaged in the manufacture of a printed firearm be a licensed gunsmith under the Gun Control Act.[95] The problem with this law is two-fold. First, this solution requires the user to apply and receive a permit to manufacture guns prior to printing at home, but does not solve the central problem of at-home manufacture and use of the printed gun. This post-creation solution depends on user honesty and still does not deal with the creation of the untraceable firearm itself, rendering it poorly conceived and under-inclusive. Second, the Gun Control Act itself does not require licensure and registration of any Title I firearm, unless the maker engages in interstate commerce with that firearm.[96] This means that the city ordinance is forcing compliance with licensing for 3-D printed weapons in a

[93] *First Ban in the Country: 3D-printed Guns Now Illegal in Philadelphia*, RT USA (Nov. 25, 2013, 8:30 AM), http://rt.com/usa/philly-gun-ban-johnson-280.

[94] *Id.*

[95] *Id.*

[96] 18 U.S.C. §§ 921–922 (2012).

way that the Act did not contemplate, as the Gun Control Act is meant to regulate guns in interstate commerce, not guns in the home for personal use.[97] As a result, this law could face serious problems when it comes to the Second Amendment, which governs the personal use of weapons and seemingly gives individuals the right to make arms under the Court's current interpretations.

In *Heller*, the Court confronted the issue of the individual right to own a weapon in the home, concluding that statutes banning handguns for self-defense in the home were unconstitutional.[98] Part of the reasoning for this decision was because handguns are the overwhelmingly preferred weapons for protection in the home and are the "quintessential self-defense weapon[s]."[99] Perhaps in the future, 3-D printed guns will be the preferred weapons for self-defense as printers become more widely accessible and inexpensive. The technology has progressed quickly and exponentially in only a few years, and in the next five years these 3-D printed weapons could easily replace traditional handguns for home safety. As the Court has noted, the right to keep and bear arms is one afforded to all Americans as an individual right, and outlawing an entire group of arms may infringe upon that right, just as outlawing handguns did in 2008 in the *Heller* case.[100] Overall, outright bans depend on forthcoming registration by users and also threaten Second Amendment privileges, while still not really attacking the root of the problem—undetectable and untraceable firearms. Any real solution must be more comprehensive than this broad ban on all 3-D printed weapons.

New York, New Jersey, Washington, D.C., and California legislatures have all also considered similar restrictions on these 3-D printed guns and have introduced local legislation similar to that of Philadelphia's ban.[101] California has gone the furthest, and seems to have developed the most comprehensive bill yet.[102] The California bill allows for at-home manufacture of 3-D printed guns, but requires any maker to first register with the state Department of Justice (hereinafter DOJ).[103] The DOJ would then run a background check on the registrant, and if the

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[97] *See id.* § 921.

[98] District of Columbia v. Heller, 554 U.S. 570, 636 (2008).

[99] *Id.* at 629.

[100] *See id.* at 592.

[101] Associated Press, *California Lawmaker Seeks Background Checks for Those Who Build Plastic Firearms that Can Slip through Metal Detectors*, FOX NEWS (Jan. 14, 2014), http://www.foxnews.com/us/2014/01/14/ghost-gun-regulations-pushed-in-california-bill [hereinafter *California Lawmaker*]; Matt Clinch, *3-D Gun Printing: Here's the Software that Stops It*, CNBC (July 3, 2013, 2:35 AM), http://www.cnbc.com/id/100861913; Matt DelSignore, *D.C. Council Considers Ban on Printable Guns*, CBS DC (May 7, 2013, 3:58 PM), http://washington.cbslocal.com/2013/05/07/d-c-council-considers-ban-on-printable-guns; Cyrus Farivar, *New NYC Bill Would Require 3D Printed Guns to be Registered with Police*, ARS TECHNICA (June 13, 2013, 8:35 PM), http://arstechnica.com/tech-policy/2013/06/new-nyc-bill-would-require-3d-printed-guns-to-be-registered-with-police; Dara Kerr, *3D-Printed Guns May Face Regulations, Bans in New York*, CNET (June 13, 2013, 8:38 PM), http://news.cnet.com/8301-11386_3-57589294-76/3d-printed-guns-may-face-regulations-bans-in-new-york.

[102] *California Lawmaker*, *supra* note 101; *see also* S.B. 808, 2013 Leg., Reg. Sess. (Cal. 2013), *available at* http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB808.

[103] *California Lawmaker*, *supra* note 101;

registrant passes the check, he or she will receive a serial number, which must be engraved on the gun within days of creation.[104] The bill aims to combat these guns in two different ways: ensuring only safe and appropriate users through the background check, and registering the user and the gun for future tracing and accountability in relation to crime. Unlike the Philadelphia law, this bill seems to contemplate the Second Amendment implications of a ban on these 3-D printed guns while still sharing its fatal flaw: user responsibility and willful registration. Violating this bill would result in a misdemeanor charge and "a fine of up to $1,000 and up to a year in jail for an illegal handgun, up to six months for a rifle or shotgun."[105] Because California is a crime-by-crime state, rather than a state which details its classes of misdemeanors, offenses with similar penalties include petty theft ($50 or less) carrying a fine of up to $1,000 and up to six months in jail, or invasion of privacy carrying a fine of up to $2,000 and up to one year in jail for a second offense.[106] Needless to say, the punishment is not overly harsh for offenders printing 3-D guns at home when compared to offenses with similar punishments, even though printing unregistered 3-D guns seems like a much more serious and dangerous infraction.

Additionally, Congressman Steve Israel of New York plans on reintroducing a bill in New York that will "ban 3-D printed guns or any other fully-plastic firearm."[107] After a previously failed attempt to ban these firearms, he plans on once again pioneering legislation against them as the technology continues to rapidly evolve.[108] This time around, his legislation will focus more on the undetectable nature of these weapons, seeking to ban fully plastic firearms rather than all 3-D printed guns.[109] He specifically noted that he is "trying to . . . make it clear that if you choose to construct a weapon or weapon component using a 3-D printer, and it's homemade, you'll be subject to penalties."[110] Above all, he seems to be mostly concerned with safety and security, stating that his proposed legislation ensures "that we have laws in place to ensure that criminals and terrorists can't produce guns that can easily be made undetectable. Security checkpoints will do little good if criminals can product plastic firearms and bring those firearms through metal detectors into secure areas like airports or courthouses."[111] Though this proposed solution does deal with safety and detection issues, it does not address the fact that these printed guns will still remain unregistered and virtually untraceable.

Overall, the current proposed legislation seems to attack three main concerns: gun making and ownership by inappropriate groups like felons and children, the manufacture of untraceable guns, and undetectable weapons making their way

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[104] *Id.*

[105] *Id.*

[106] CAL. PENAL CODE §§ 490, 647 (West 2014).

[107] Andy Greenberg, *Bill to Ban Undetectable Firearms Is Coming Back*, WIRED (Apr. 6, 2015, 7:00 AM), http://wired.com/2015/04/bill-ban-undetecable-3-d-printed-guns-coming-back/.

[108] *Id.*

[109] *Id.*

[110] *Id.*

[111] *Id.*

through security checkpoints. A ban, even just on plastic guns, does not fully address any of these concerns because it does not stop the production of the guns, but it punishes, after the fact, those that create unregistered guns. Similarly, the serial numbers plus registration approach attempts to address the overall concerns, but it largely fails due to its reliance on user compliance with only the possibility of minimal punishment. A true solution will address these concerns at their root and will require a comprehensive effort.

B. A Real Response

The most salient solution will truly be a three-pronged approach, designed to combat each concern regarding 3-D printed guns. It is particularly important that this matter is attended to in an expeditious manner, especially considering that those without any engineering or gun-making expertise can quickly and easily print guns at home with readily available technology, designs, and materials. All hands will need to be on deck to ensure proper handling of this dicey situation. A technological, statutory, and practical approach will help serve three main purposes. First, it will help to curb the production of untraceable guns. Second, it will limit the production of 3-D printed guns to appropriately licensed groups and provide harsher punishments for violators as a deterrent measure. Lastly, it will deal with security issues and promote safety. These efforts, when combined, provide the best basis for dealing with these 3-D printing problems in ways that simple bans cannot.

1. Step One: Turn to Technology.—The technological solution will certainly be the trickiest, and many options must be considered. Certain technological answers together operate as the best option for limiting the creation of these guns because they can prevent a user from accessing a design and printing a gun. The first thing to recognize is that none of these solutions will be perfect and none will completely solve the problem, so a collaborative effort is the only way to ensure maximum success. Despite the fact that the U.S. State Department asked Cody Wilson to take down his plan for the "Liberator," the plan was accessed and downloaded over 100,000 times in two days and over a million times since then.[112] The plans still exist and are easily printable online, so the question becomes: how do we control the exchange of the plans and how do we monitor who gets them?

The first answer may be to go to the 3-D printer manufacturers and enlist their help. The Danish technology start-up, Create It REAL, has created software that can block the printing of any weapons.[113] The software works as a parental control for the printer by not permitting printing if the plan is for a recognizable weapon.[114] The ideal consumers of this software would be the 3-D printer manufacturers who would install this software on all devices prior to selling them

[112] Greenberg, *supra* note 43; Sperry, *supra* note 40.

[113] Clinch, *supra* note 101.

[114] *See id.*

to the public, reducing their liability for these 3-D printed guns.[115] If a user were to begin printing a gun on one of these manufacturer's printers, it would alert the manufacturer, not allow the printing, or send a warning to the user of the potential danger.[116] Requiring that all printer manufacturers install this software to block the printing of guns or at least block the printing of guns without proper licensing and registration would be a workable and viable solution. It could also fit into lawmakers' plans because it would require that the printer have a proper license to manufacture registered guns and this system could stop any printer who did not "log in" with that identifying information.

However, there are many flaws in this plan. First, the printed item would need to be recognizable as a firearm; the components of a firearm like the "Liberator" may not be identifiable enough to trigger the alert in the software because the pieces are all manufactured separately and each on its own does not look like a piece of a gun.[117] The only way that the Liberator plan could set off the alert would be if the printer printed the exact model, which is unlikely as technology changes, users become more proficient, and plans proliferate and are made more accessible.[118] Second, hacking also poses a problem, as the software is likely not foolproof. If the users can design a plan for a gun, they probably have the technological wherewithal to circumvent the software by manufacturing pieces of the weapon and then assembling it. This software may serve as a good starting point, as it certainly would weed out any pedestrian printers and act as a parental control to stop children from printing.

Additionally, 3-D printer manufacturers could equip their printing interface with a feature that requires that all printed items, regardless of type, to be printed with a serial number that matches the printer. This could significantly cut down on untraceable guns printed at home because the self-made guns do not currently contain serial numbers. All parts of the gun printed would contain a serial number, including the smallest parts. Since filing off the number could damage the smaller pieces of the gun, a user would have to keep the serial number fully intact or risk damaging the gun. Moreover, with multiple serial numbers on each printed gun, law enforcement could easily identify that weapon. Again, while not foolproof, it helps to solve the accountability piece of the puzzle.

Additionally, Congress could enact legislation to require the serial number identification measure under its power to tax, giving tax breaks to those manufacturers who comply, and heavily taxing those that do not, just as it now taxes manufacturers of Title II weapons under the National Firearms Act.[119] Although serial numbers can be filed off 3-D printed weapons, just as they can be on traditional guns, this option provides an additional and constitutionally acceptable safety measure. Since the Third Circuit has laid the groundwork by

[115] *Id.*
[116] *Id.*
[117] *See id.*
[118] *See id.*
[119] 26 U.S.C. § 5821 (2012).

declaring a ban on guns in interstate commerce without serial numbers constitutional,[120] similar bans could be enacted for 3-D printed guns. Because, the federal Gun Control Act already bans guns in interstate commerce without a serial number, it could be updated to include 3-D printed guns explicitly. Through the states' police power, states could also enact their own bans on 3-D printed guns without serial numbers manufactured at home and not moving in interstate commerce. With the combination of federal taxation on noncompliant manufacturers, amendment of the Gun Control Act to specifically ban 3-D printed guns with no serial number, and statewide bans, this technological solution is rather appealing as well.

There will, of course, be similar hacking and work-around concerns, but this solution ultimately solves the problem better than the proposed solutions currently in state legislatures. California state senators have proposed a bill that would require serial numbers to be engraved on the printed guns after the guns are manufactured.[121] This means that the user would register himself or herself for permission to print the gun, go through a background check, receive approval, print the gun, and then engrave a serial number on that weapon.[122] Realistically, expecting casual printers to go through all of these steps, even without nefarious intentions, would be naïve. California's approach would require massive public education in order to make this bill truly effective, which would be a huge undertaking and would drain much state money, time, and energy. Whereas, getting the printing companies on board forces the burden on the private sector rather than draining precious governmental resources. The technology companies would then be the ones to expend the money, time, and effort developing mandatory serial number printing. And by printing with serial numbers there is no risk of user nonfeasance—the serial number will be printed on each item and there would be no need for after the fact registration and engraving. Further, this could lead to better and more productive law enforcement because the gun owner would have had to actively remove the serial number from a weapon rather than not register it and claim ignorance of the process. Knowingly removing the serial number could warrant a harsher punishment, perhaps a high-class misdemeanor, which is what many states now require for the acquisition of a gun without a permit.[123]

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[120] United States v. Marzzarella, 614 F.3d 85, 101 (3d Cir. 2010).

[121] *California Lawmaker*, *supra* note 101.

[122] *Id.*

[123] *See* IOWA CODE ANN. § 724.16 (West 2013) (stating that acquiring a handgun without a permit is an aggravated misdemeanor, which under IOWA CODE ANN. § 903.1 (West 2014) is punishable by up to two years imprisonment, a fine of $625 to $6,250 or both); MINN. STAT. ANN. § 624.7132 (West 2014) (stating that acquiring a handgun without permit is a gross misdemeanor, which, under MINN. STAT. ANN. § 609.02 (West 2014), is punishable by up to one year in jail, a fine of up to $3,000, or both); N.J. STAT. ANN. §§ 2C:39-5, 2C:58-4 (West 2005) (stating that possession of a handgun without permit is a3rd degree crime, which, under N.J. STAT. ANN. § 2C:43-3 (West 2005 & Supp. 2013) is punishable by three to five years imprisonment, a fine of up to $15,000, or both); N.Y. PENAL LAW §§ 265.01, 03, .20 (McKinney 2008) (stating that possession of a handgun without permit

Legislatures could also enlist the help of the Copyright Alert System (CAS), in which Internet Service Providers (ISPs) are alerted if their users are illegally downloading copyrighted material.[124] The ISP, once alerted, informs the user that he or she is illegally downloading protected content that will ultimately result in the ISP shutting off the user's service and alerting law enforcement if the infringement persists over a long period of time and the user does not stop after reasonable warnings.[125] Major production companies back the CAS in order to regulate illegal copying of movies, music, and other content.[126] So in order to stop the distribution of gun plans for 3-D printers online, the government could develop a system similar to the CAS to scan for traded gun plans as well. The system could be set up in a similar fashion as the CAS or work in conjunction with the CAS, in which a content provider joins peer-to-peer networks, identifies an infringing IP address, which is then sent to the ISP, and the ISP then sends a copyright alert to the infringing IP address.[127] The new system could join these peer-to-peer networks, acquiring IP addresses of users downloading gun plans, and send the IP address and user information to law enforcement. Since the enactment of the PATRIOT Act, the government has broad latitude for surveillance of online activity in connection to terrorism.[128] This scanning of the peer-to-peer networks could be policed in order to combat terrorism by monitoring users who frequently download, mass download, or mass distribute these plans. Of course, any system like the CAS will not be foolproof: it can be circumvented by experienced computer users and will not track printers who make their own plans. But, it perhaps could track the most dangerous file-sharers. This system would act as an extra safeguard so that law enforcement officials can keep track of where the plans are going so that they do not fall into the wrong hands.

Generally, these technological solutions are not perfect and can be outmaneuvered. But, they do offer some benefits that outright bans and after the fact gun registrations cannot. Taken separately or together, they do serve the three purposes of 3-D printing regulation: first to regulate untraceable weapons through mandatory serial numbers, second to ensure that only proper parties can manufacture guns by using parental control software, and third to reduce security and safety issues through the monitoring of the plan distribution.

2. Step Two: Strengthen the Statutes.—Along with the technological piece of this problem, the current statutory framework, when it comes to regulating 3-D printed

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is class A misdemeanor, which, under N.Y. PENAL LAW §§ 70.15, 80.05 (McKinney 2009), is punishable by up to one year in prison, a fine of up to $1,000, or both).

[124] *See What Is a Copyright Alert?*, CENTER FOR COPYRIGHT INFO., http://www.copyrightinformation.org/the-copyright-alert-system/what-is-a-copyright-alert (last visited Jan. 20, 2015).

[125] *Id.*

[126] *Id.*

[127] *Id.*

[128] *See* 18 U.S.C. § 2516 (2012) (stating that the Attorney General or other noted officials may authorize an application to a federal judge to grant interception of wire or oral communications by the FBI if evidence points to terroristic acts).

guns, is severely lacking in specificity and substance. Without any federal regulation of these guns, all states will adopt different measures to control their manufacture, use, and sale, when a national stance is necessary and appropriate. This does not require a huge overhaul of the current law, but minor tweaking could ramp up protection before the problem spirals out of control.

First, amending the Gun Control Act is key. Again, the Gun Control Act regulates Title I firearms in interstate commerce and requires licensure as a gun manufacturer, importer, or dealer.[129] The Act does not, however, require a license to manufacture or make a gun for personal use.[130] Currently the Act does not mention any 3-D printed guns or guns made by additive manufacture. In order to get at the illegal sale of 3-D printed weapons, the Gun Control Act should be amended to include in its description of a firearm "any weapon made through the process of 3-D printing or additive manufacture." By adding this phrase to the current statute, there would be no confusion as to the fact that if a printer manufactures weapons using a 3-D printer and intends to sell them, he or she must apply for and receive a license before doing so. If he fails to follow these steps, the illegal manufacturing, importing, or dealing these weapons therefore constitutes a federal offense under this newly revised statute, carrying the punishment of a fine and up to five years in prison.[131] Therefore, by adding that extra descriptor to the term "firearm," no 3-D printed guns can be sold or dealt without proper licensing. Harsher punishments could be added for manufacturing or dealing 3-D printed guns without a license, such as permanent barring from licensure. This could serve as a serious deterrent because of the permanency of the punishment and the harm to the offender's business. Overall, this punishment would not infringe on the offender's Second Amendment rights, as he or she could still manufacture a weapon for his or her personal use, but no longer have the right to sell weapons.

Next, the National Firearms Act should also be amended to require that all manufacturers of these Title II 3-D printed weapons apply for a license. Since licensing is required for the other Title II weapons, a simple addition of "any weapon made through the process of 3-D printing or additive manufacture" to the description of a firearm could force all printers of 3-D guns to register their gun even if it is for personal use in the home.[132] Additionally, strict enforcement of the harsh penalties found in this chapter will serve as a measurable deterrent for gun makers, as any violation of the Act carries a fine up to $10,000 or imprisonment up to ten years or both.[133] No overwhelming Second Amendment issues could arise here because printers maintain all rights to manufacture a gun; now, simply registration of that printed gun would be required. No major complaints regarding with the registration of Title II weapons have arisen, so 3-D printed guns would likely face similarly futile opposition. This would require the registration of any

[129] 18 U.S.C. §§ 921–22 (2012).
[130] *Id.* § 922; *see also* Brown, *supra* note 72.
[131] 18 U.S.C. §§ 922, 924.
[132] *See generally* 26 U.S.C. § 5841 (2012).
[133] *Id.* § 5871.

3-D printed gun for home or personal use and the Gun Control Act would require a license for any sale of 3-D printed guns. Together, all 3-D printed guns would be accounted for; so, concerns about non-traceable guns and guns getting into the wrong hands can be tempered by these minor additions. The only concern to be addressed is the undetectable nature of plastic 3-D printed weapons.

As such, the final piece would be amending the Undetectable Firearms Act. Although it was recently renewed, some changes may be in order. Although it is already illegal to manufacture, possess, and sell a weapon that may not set off a metal detector, and all firearms must contain 3.7 ounces of metal, no specific reference is made to 3-D printed guns or guns made by additive manufacture in the Act.[134] For clarity and straightforwardness, the Act should be amended to include language stating that "all 3-D printed weapons or guns made through additive manufacture must contain 3.7 ounces of metal," and any violation thereof would then constitute a federal offense. This clarification would require that all registered guns and licensed gun manufacturers include at least 3.7 ounces of metal in each gun produced under the Gun Control Act and the National Firearms Act in order to be legal weapons. This would not change much in the meaning of this Act, but it would explicitly and clearly require all 3-D printed guns to comply with general firearm regulations, closing any loopholes and shutting down any attempt to test the limits. The amended paragraph (p)(1)(C) would read as follows (new material italicized):

> (C) the term 'Security Exemplar' means an object, to be fabricated at the direction of the Secretary, that is —
>
> (i) constructed of, during the 12–month period beginning on the date of the enactment of this subsection, 3.7 ounces of material type 17–4 PH stainless steel in a shape resembling a handgun, *including any weapon made through the process of 3-D printing or additive manufacture*, and
>
> (ii) suitable for testing and calibrating metal detectors . . . .

As previously mentioned, although the Act's original intent was to target Glock 17 plastic parts, plastic 3-D printed weapons are presumably covered by this Act as well.[135] However, by broadening the scope of the Act by specifically mentioning 3-D printed guns, the public, manufacturers, dealers, and security personnel will suffer no confusion in understanding that this applies to all 3-D printed weapons, whether for personal or commercial use.

While the overall changes to the statutory scheme would be minor, they would have widespread implications. First, all 3-D printed guns must include at least 3.7 ounces of metal in order to comply with the Undetectable Firearms Act, regardless of whether the use is personal or commercial. Next, any maker or manufacturer of 3-D printed guns must register his or her guns under the National Firearms Act

[134] Undetectable Firearms Act of 1988, Pub. L. No. 100-649, § 2, 102 Stat. 3816 (codified as amended at 18 U.S.C. § 922 (2012)).

[135] *See supra* text accompanying note 91.

and pay the associated tax. Lastly, anyone who engages in the sale, distribution, or importation of 3-D printed firearms must apply for a license to do so and receive said license before engaging in that dealing. Truly the most desirable route would be to prohibit dealing these 3-D printed plastic weapons completely under the Gun Control Act, at least until they become more regulated and monitored. However, with a divided Congress, this regulation of dealing might be the best option for true reform. Ultimately, the last step is a practical approach to dealing with these guns, which will take time and patience, but we cannot afford for this piece to fall by the wayside.

3. Step Three: Pump Up Practical Protection.—Outside of the legal framework, necessary steps must be taken by our governmental agencies in order to ensure safety now and in the future. By promoting gun safety and education in the classroom, the dangers of 3-D printing can be curbed starting at a young age. Moreover, ramping up security measures and developing better searching techniques for these weapons can easily placate the threat of plastic guns.

As aforementioned, many school systems have begun using 3-D printers in the classroom to generate interest in math and science and to teach children about new technology that they will use for the rest of their lives.[136] With that said, the Department of Education should spearhead an initiative to teach 3-D printing safety and gun safety in schools with this technology. There is already strong bipartisan support for gun safety training in schools, with Michigan schools teaching a gun safety course for students in elementary school.[137] With the gun safety education topic already on the table and 3-D printers integrated into classroom learning, now seems like the perfect time to bring the two together. Many supporters of gun safety education agree that the educational aspect is not the only piece of the puzzle, and they call for interventions, school counselor assistance, and parental involvement to avoid dangerous situations.[138] Especially when it comes to 3-D printing safety, parental engagement is key. If these printers are going to be in nearly every home within the next several years, parents need to be actively invested in safety as well. Schools educating parents about parental controls and encouraging the monitoring of their children's use of the printer is critical as children grow up using this technology and create a variety of 3-D printed objects. These 3-D printers in schools and homes only provide greater access for children to guns. This is alarming considering that the Centers for Disease Control report that the "rate of firearms death among children younger than 13 remains 25 times that of the other top 25 industrialized nations combined."[139] With the availability of guns in the home on the rise, safety is now

[136] *See supra* text accompanying note 39.

[137] Claire Moore, *To Teach or Not to Teach Gun Safety in School*, ABC NEWS (Aug. 20, 2014), http://abcnews.go.com/US/story?id=96091.

[138] *Id.*

[139] *Id.*

paramount. In order to secure a safe future, children are the starting point, and gun safety education in school is key.

Additionally, added security measures will certainly be important for safety in protected areas. Despite the provisions in the Undetectable Firearms Act, these 3-D printed guns pose a huge problem because no metal is truly needed to make them operable.[140] This would require huge efforts by agencies like the Transportation Security Administration (hereinafter the TSA) to recognize the presence of these weapons and develop thorough ways to search and locate them. Fortunately, the full body scanners at airports have become nationwide staples for airport security and metal detectors have become somewhat outmoded. Although full body scanners have met great opposition, they have been retrofitted to be less revealing and still remain.[141] These scanners can spot a gun even if it is plastic, so the security measures are ahead of the curve when it comes to airport scanners.[142] But what about the carry-on luggage? What about political events? What about government buildings, museums, and courthouses? What about sporting events held in massive arenas? The carry-on bags are not subject to full scans and most events and government buildings only have metal detectors or wands. The Department of Homeland Security recognizes the risks associated with plastic guns and has acknowledged that it will be a challenge to keep presidential events, airplanes, and government buildings safe with this new technology.[143]

The ATF is also worried about the security threats that these plastic guns pose and has been working with the TSA, law enforcement, and the Secret Service on how to combat the emerging problem.[144] The best immediate option is to utilize pat-down searches, as they are the only search technique that is workable on a large-scale level at this time.[145] Unfortunately, the ATF has scarce resources and seems to be struggling to stay on top of this new technology.[146] Perhaps allocating more of the budget to the ATF or the Department of Homeland Security to develop new safety measures is in order. This expanded budget could allow the government to sponsor safety-related projects and develop new search techniques, as Manchester Metropolitan University (hereinafter MMU) in the UK has done. MMU has developed a new radar scanner that specifically targets safety in crowd

[140] *See* Greenberg, *supra* note 43.

[141] Scott Neuman, *TSA: No More Graphic, Full-Body Airport Scans*, NPR (May 30, 2013, 7:19 PM), http://www.npr.org/blogs/thetwo-way/2013/05/30/187376559/tsa-no-more-graphic-full-body-airport-scans.

[142] *California Lawmaker*, *supra* note 101.

[143] *DHS: It Is Impossible to Stop 3D Plastic Guns from Getting Past Security Checkpoints*, HOMELAND SECURITY NEWS WIRE (May 24, 2013), http://www.homelandsecuritynewswire.com/dr2010524-dhs-it-is-impossible-to-stop-3d-plastic-guns-from-getting-past-security-checkpoints.

[144] Carrie Johnson, *Plastic Guns Made with 3-D Printers Pose New Security Concerns*, NPR (Nov. 14, 2013, 3:04 AM), http://www.npr.org/blogs/alltechconsidered/2013/11/14/245078880/plastic-guns-made-with-3-d-printers-pose-new-security-concerns.

[145] *See generally id.*

[146] *Id.*

situations.[147] The new scanner sends out a signal into a crowd of bustling people and it can detect if someone is carrying a plastic 3-D printed gun through radio waves.[148] If the scanner detects a possible threat, the signal from someone carrying a plastic gun then is sent to a computer where it will be classified.[149] If the signal matches the profile of a 3-D printed weapon, the system alerts authorities within one second.[150] It specifically targets non-metallic weapons and can detect them up to about eighty feet away.[151] This technology is in its infancy and will only continue to grow and develop. The ATF or Department of Homeland Security should certainly consider this a valuable option as 3-D printing becomes more engrained in our technological future. The government should be looking into any new options for added protection as security threats are now imminent with 3-D printing technology because anyone—any child, any felon, any terrorist, anyone mentally unstable, anyone with no gun experience—can now print, own, and fire a deadly weapon. New and more security is crucial now more than ever.

In the end, both early education and increased security will provide the extra-legal protection that this new technology requires. Hopefully with more gun awareness and safety training, the security measures will be less necessary; but, in the meantime, new protocols, search processes, and detection procedures are desperately needed to quell the public's fear and anxiety of these new ghost guns.

CONCLUSION

This gun control dilemma is not an easy one. There are no easy fixes and no simple solutions. A new and emerging problem of this nature and degree requires a considered and calculated response, targeting specific and achievable goals. The rationale behind plastic gun control measures is three fold: first, to control who can make and use these firearms; second, to reduce untraceable firearms and prevent the production of unidentifiable weapons; and third, to reduce the presence of undetectable guns and minimize security risks. Through technological efforts to curb unregistered and untraceable gun production by anyone, the goals of gun control can be achieved and greater safety for all using the technology is possible. Statutory criminalization of unregistered guns, unlicensed dealers, and undetectable guns limits who can have these weapons and generally limits the proliferation of unidentifiable guns. And practical policies decrease the risk of gun violence and misuse. This is a huge, unprecedented problem that will call for much finesse and cooperation. It will require deliberate rifle shots targeted at each objective and concern, rather than a shotgun approach in banning all 3-D guns, which will neither solve the problem nor quell any concerns. Overall, any gun control policy

[147] Kyle Maxey, *New Radar Scanner Can Detect 3D Printed Weapons*, ENGINEERING.COM (Mar. 4, 2014), http://www.engineering.com/3DPrinting/3DPrintingArticles/ArticleID/7256/New-Radar-Scanner-Can-Detect-3D-Printed-Weapons.aspx.

[148] *Id.*

[149] *Id.*

[150] *Id.*

[151] *See id.*

that utilizes technological, statutory, and practical solutions will be largely more successful than gun registrations that depend on voluntary compliance, willful ignorance of the problem, or outright bans.